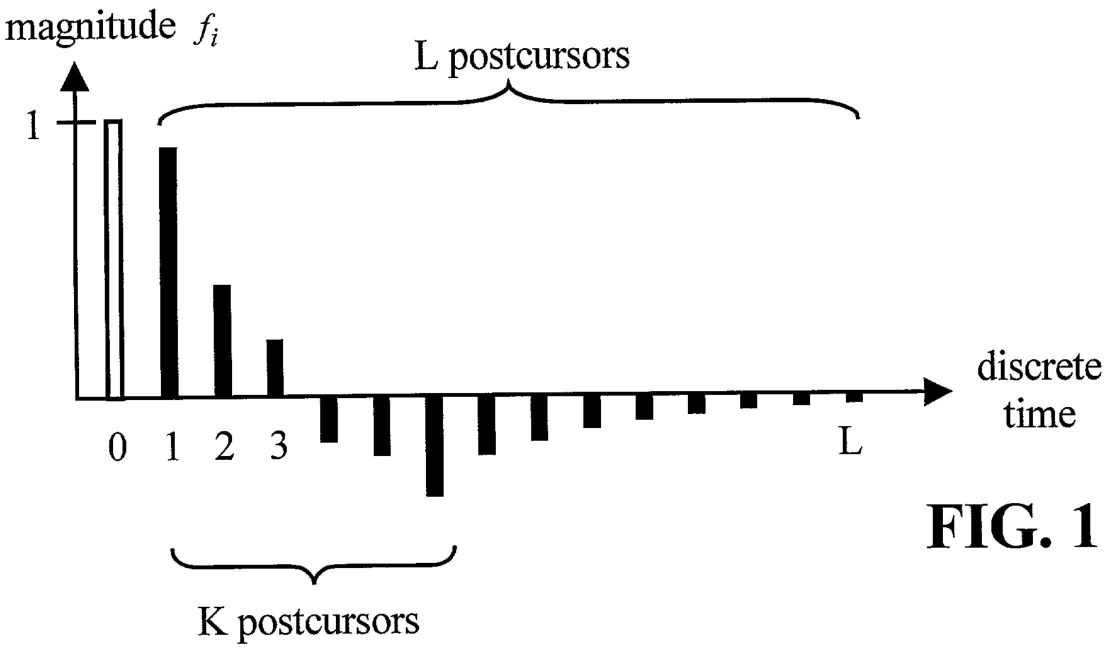

magnitude f_i
L postcursors
1
discrete time
0
1
2
3
L
K postcursors

FIG. 1

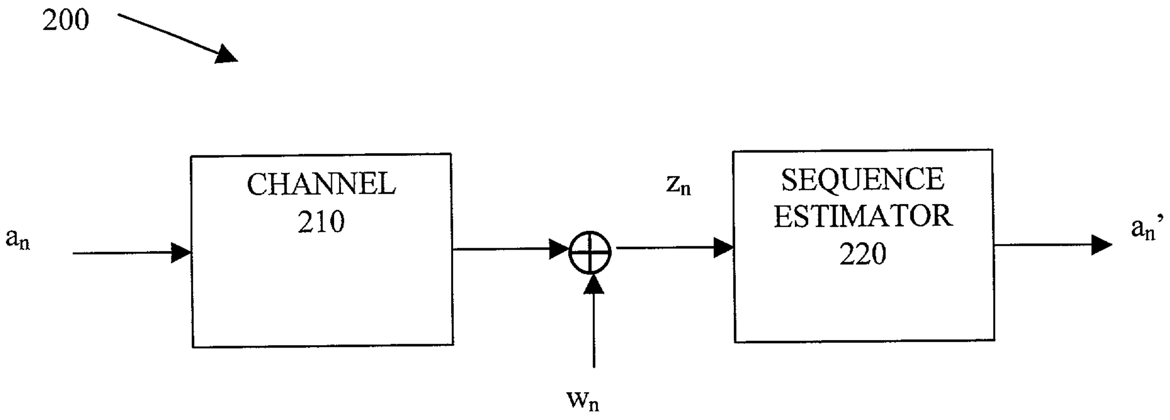

200
a_n
CHANNEL 210
z_n
SEQUENCE ESTIMATOR 220
a_n'
w_n

FIG. 2

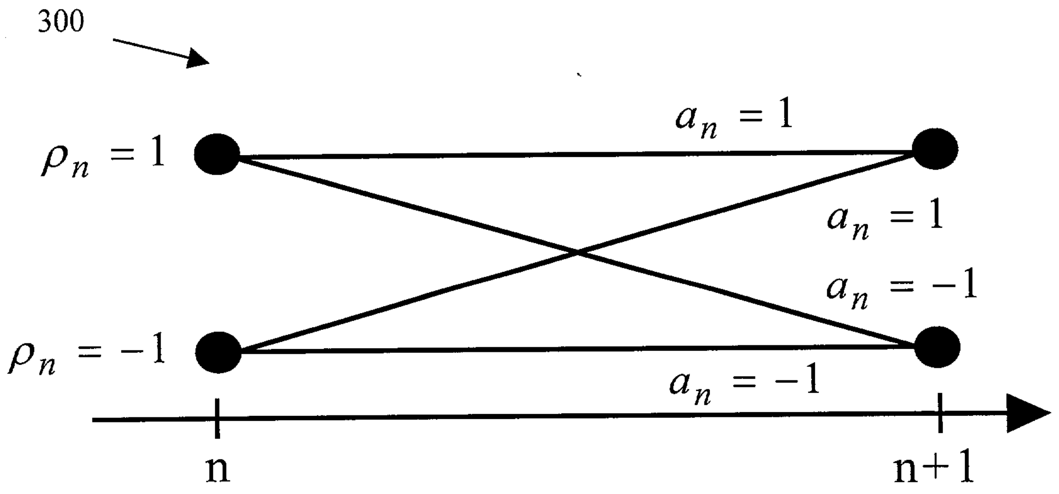

300
$\rho_n = 1$
$\rho_n = -1$
$a_n = 1$
$a_n = 1$
$a_n = -1$
$a_n = -1$
n
n+1

FIG. 3

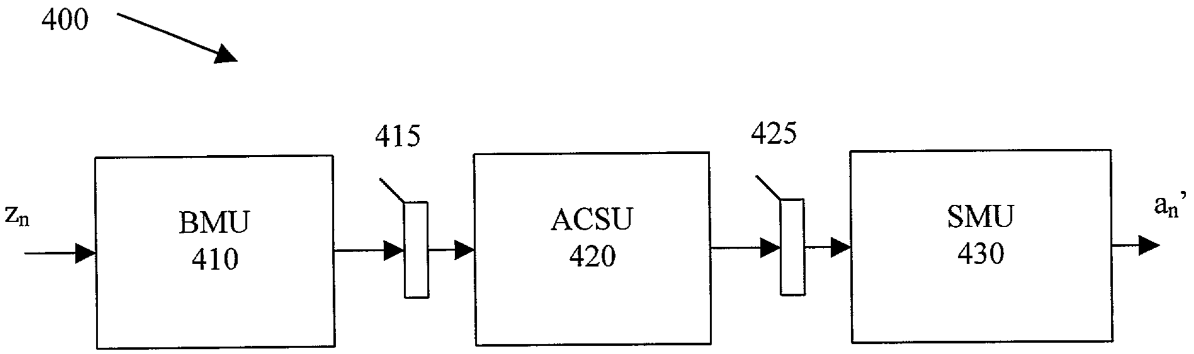

400
z_n
BMU
410
415
ACSU
420
425
SMU
430
a_n'

FIG. 4

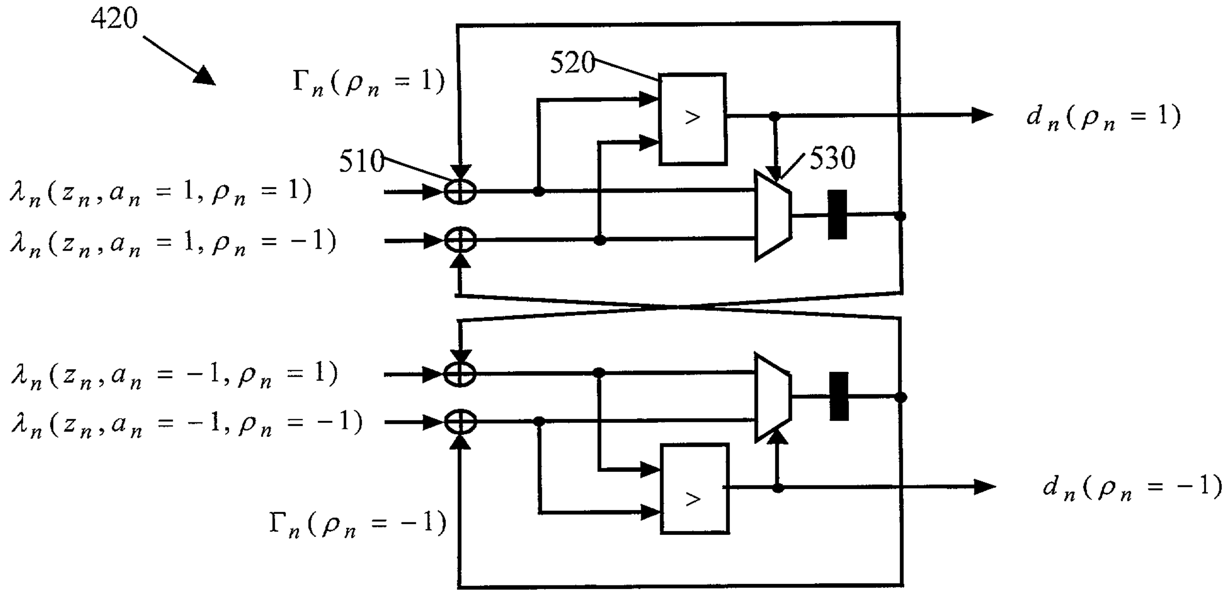


FIG. 5

Complexity and Critical Path Analysis Table -- 600

	MLSE **620**	**RSSE** **630**
Complexity		
No. of states:	2^L	2^K
No. of BMs	2^{L+1}	2^{K+1}
ADDs in DFU:	—	$S \times L$
Critical path	2 ADDs 2-to-1 MUX	$L-K+3$ ADDs 2-to-1 MUX LUT SHIFT

FIG. 6

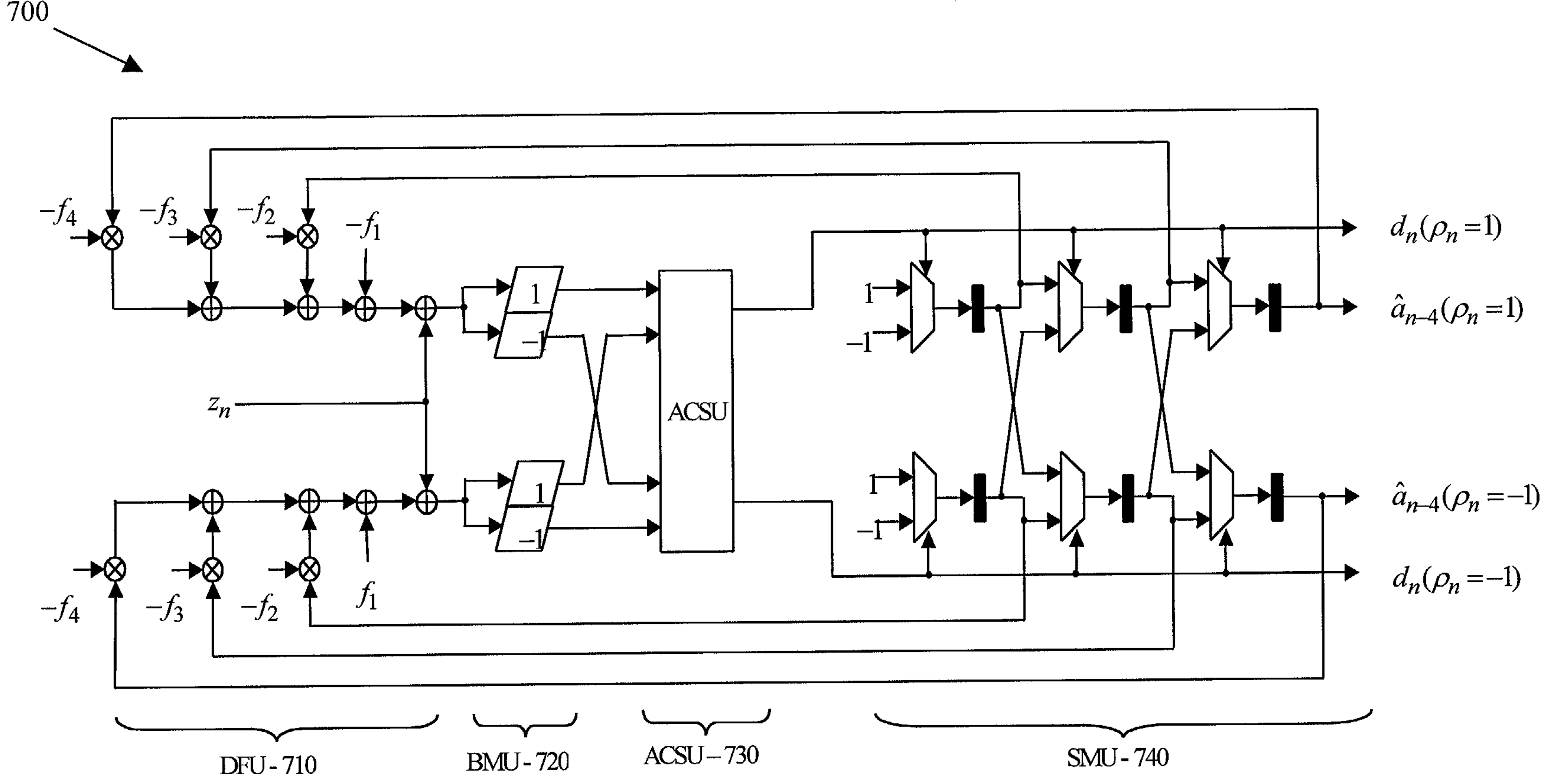

700
$-f_4$
$-f_3$
$-f_2$
$-f_1$
z_n
f_1
$-f_4$
$-f_3$
$-f_2$
1
−1
1
−1
ACSU
1
−1
1
−1
$d_n(\rho_n = 1)$
$\hat{a}_{n-4}(\rho_n = 1)$
$\hat{a}_{n-4}(\rho_n = -1)$
$d_n(\rho_n = -1)$
DFU - 710
BMU - 720
ACSU – 730
SMU - 740

FIG. 7A

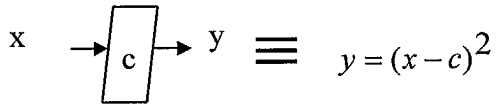
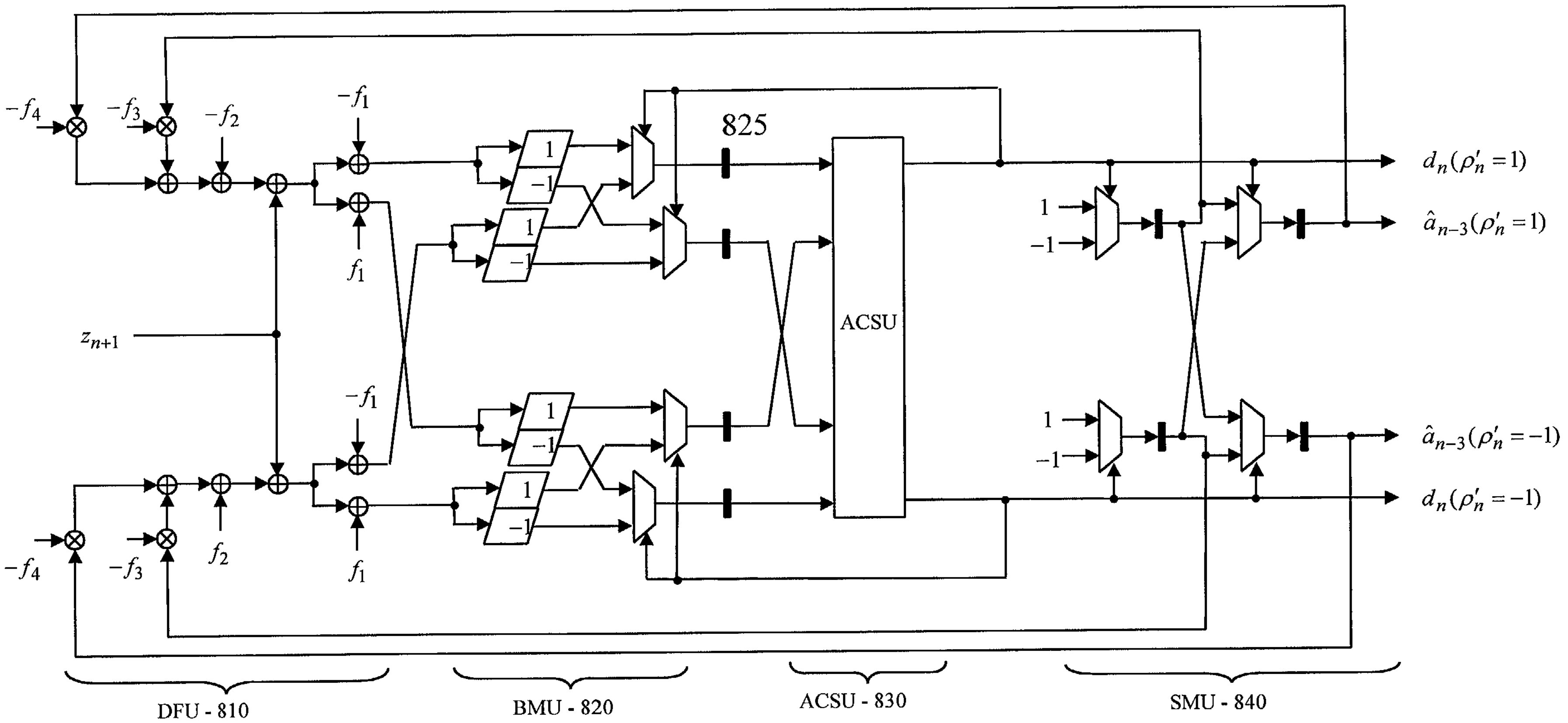

x
c
y
≡
$y = (x - c)^2$

FIG. 7B



$-f_4$
$-f_3$
$-f_2$
$-f_1$
f_1
z_{n+1}
$-f_1$
f_1
$-f_4$
$-f_3$
f_2
1
−1
1
−1
1
−1
1
−1
825
ACSU
1
−1
1
−1
$d_n(\rho'_n = 1)$
$\hat{a}_{n-3}(\rho'_n = 1)$
$\hat{a}_{n-3}(\rho'_n = -1)$
$d_n(\rho'_n = -1)$
DFU - 810
BMU - 820
ACSU - 830
SMU - 840

FIG. 8

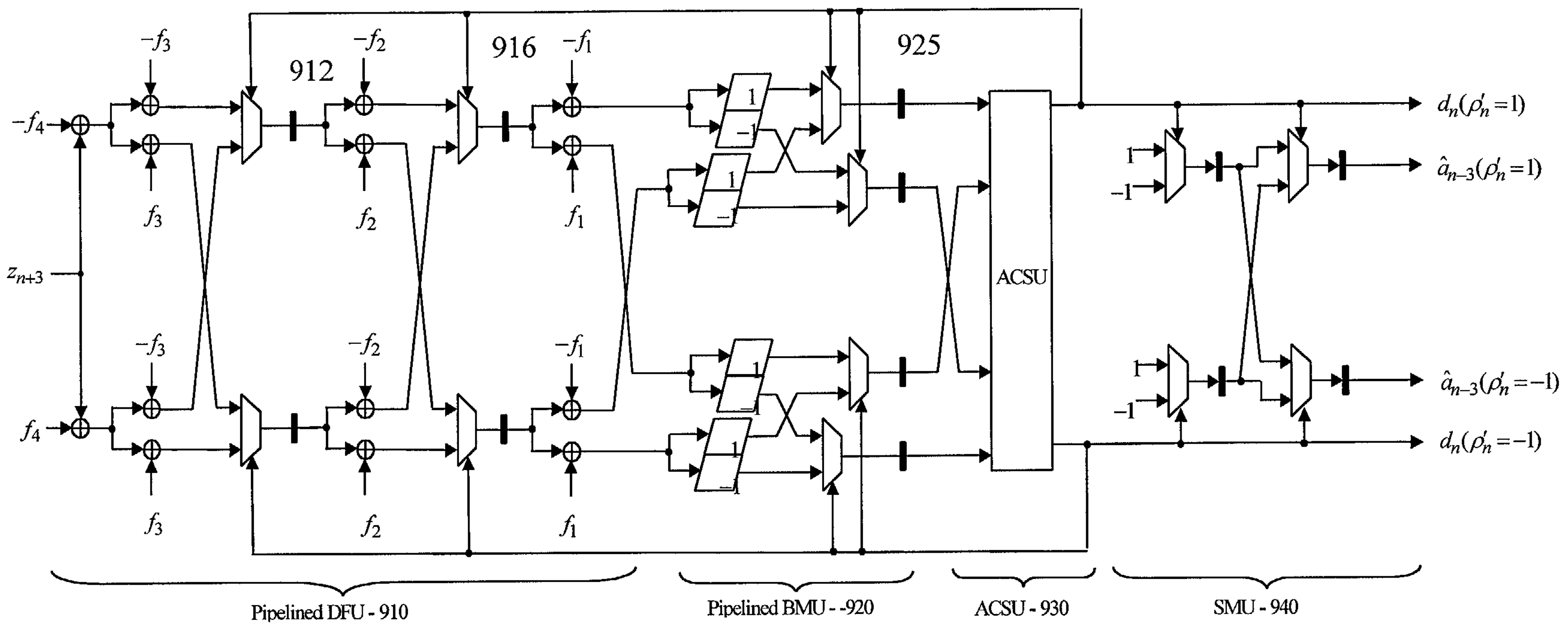

$-f_4$
f_4
z_{n+3}
$-f_3$
f_3
$-f_3$
f_3
912
$-f_2$
f_2
$-f_2$
f_2
916
$-f_1$
f_1
$-f_1$
f_1
1
−1
1
−1
1
−1
1
−1
925
ACSU
1
−1
1
−1
$d_n(\rho'_n=1)$
$\hat{a}_{n-3}(\rho'_n=1)$
$\hat{a}_{n-3}(\rho'_n=-1)$
$d_n(\rho'_n=-1)$
Pipelined DFU - 910
Pipelined BMU - -920
ACSU - 930
SMU - 940

FIG. 9

Complexity and Critical Path Analysis Table of Pipelined RSSE - 1000

	Pipelined RSSE
Complexity	
No. of BMs:	2^{K+2}
ADDs in DFU:	$S\times(L-M+2M)=S\times(L+M)$
Critical path ($M=L-K$)	2 ADDs 2-to-1 MUX

FIG. 10

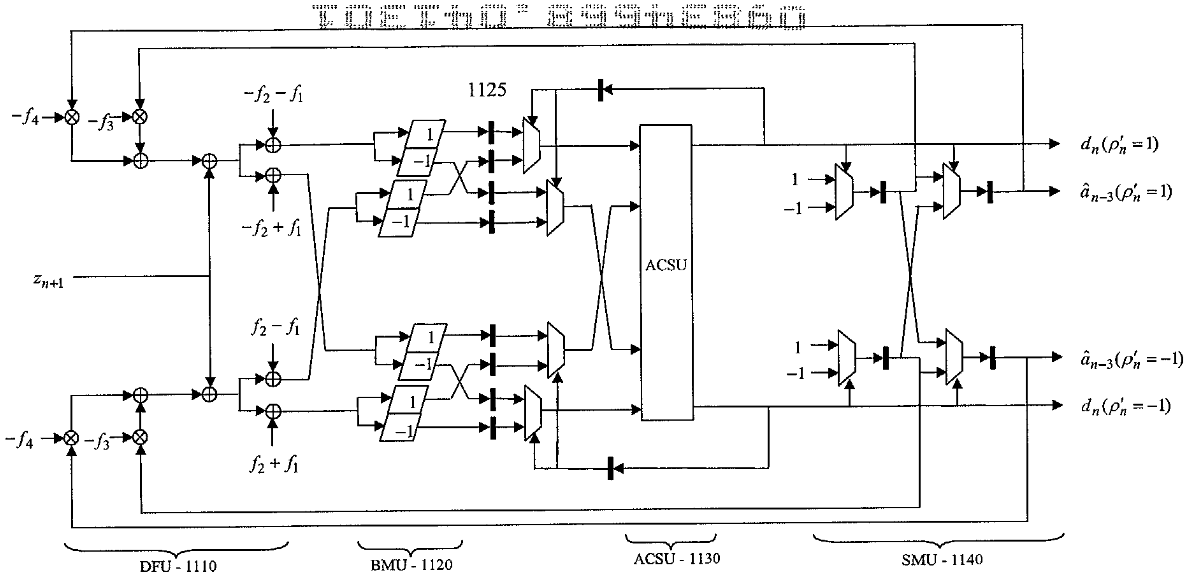

$-f_4$
$-f_3$
$-f_4$
$-f_3$
z_{n+1}
$-f_2-f_1$
$-f_2+f_1$
f_2-f_1
f_2+f_1
1125
1
−1
1
−1
1
−1
1
−1
ACSU
1
−1
1
−1
$d_n(\rho'_n=1)$
$\hat{a}_{n-3}(\rho'_n=1)$
$\hat{a}_{n-3}(\rho'_n=-1)$
$d_n(\rho'_n=-1)$
DFU - 1110
BMU - 1120
ACSU - 1130
SMU - 1140

FIG. 11

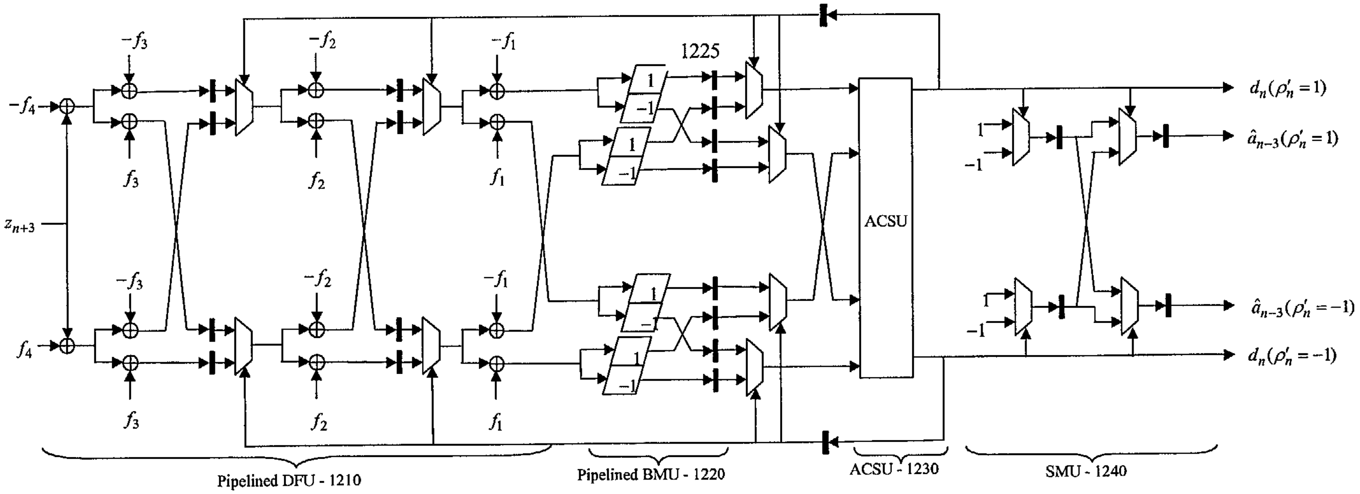

$-f_4$
f_4
z_{n+3}
$-f_3$
f_3
$-f_3$
f_3
$-f_2$
f_2
$-f_2$
f_2
$-f_1$
f_1
$-f_1$
f_1
1225
1
−1
1
−1
1
−1
1
−1
ACSU
1
−1
1
−1
$d_n(\rho'_n=1)$
$\hat{a}_{n-3}(\rho'_n=1)$
$\hat{a}_{n-3}(\rho'_n=-1)$
$d_n(\rho'_n=-1)$
Pipelined DFU - 1210
Pipelined BMU - 1220
ACSU - 1230
SMU - 1240

FIG. 12

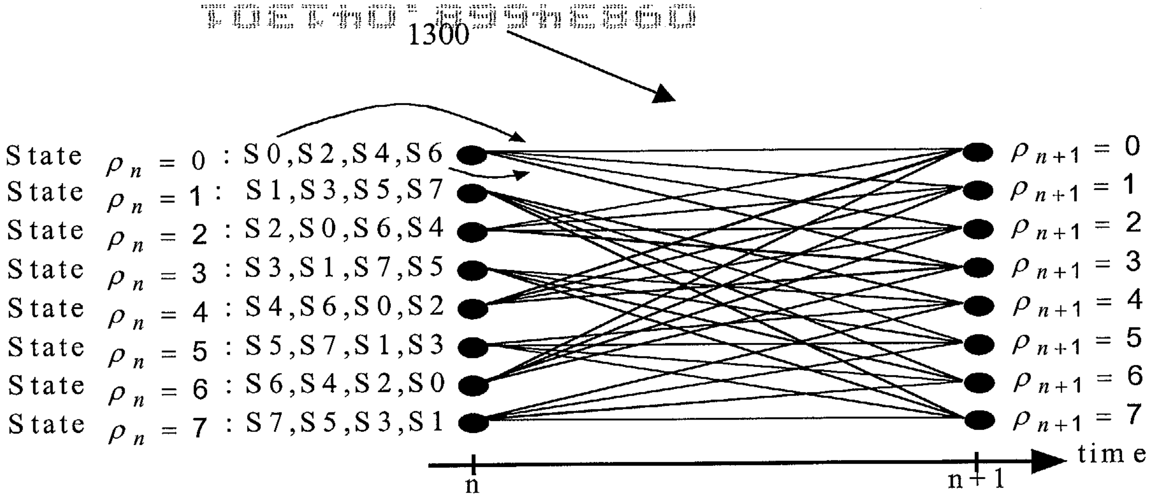

1300
State ρ_n = 0 : S0,S2,S4,S6
State ρ_n = 1 : S1,S3,S5,S7
State ρ_n = 2 : S2,S0,S6,S4
State ρ_n = 3 : S3,S1,S7,S5
State ρ_n = 4 : S4,S6,S0,S2
State ρ_n = 5 : S5,S7,S1,S3
State ρ_n = 6 : S6,S4,S2,S0
State ρ_n = 7 : S7,S5,S3,S1
ρ_{n+1} = 0
ρ_{n+1} = 1
ρ_{n+1} = 2
ρ_{n+1} = 3
ρ_{n+1} = 4
ρ_{n+1} = 5
ρ_{n+1} = 6
ρ_{n+1} = 7
time
n
n+1

FIG. 13

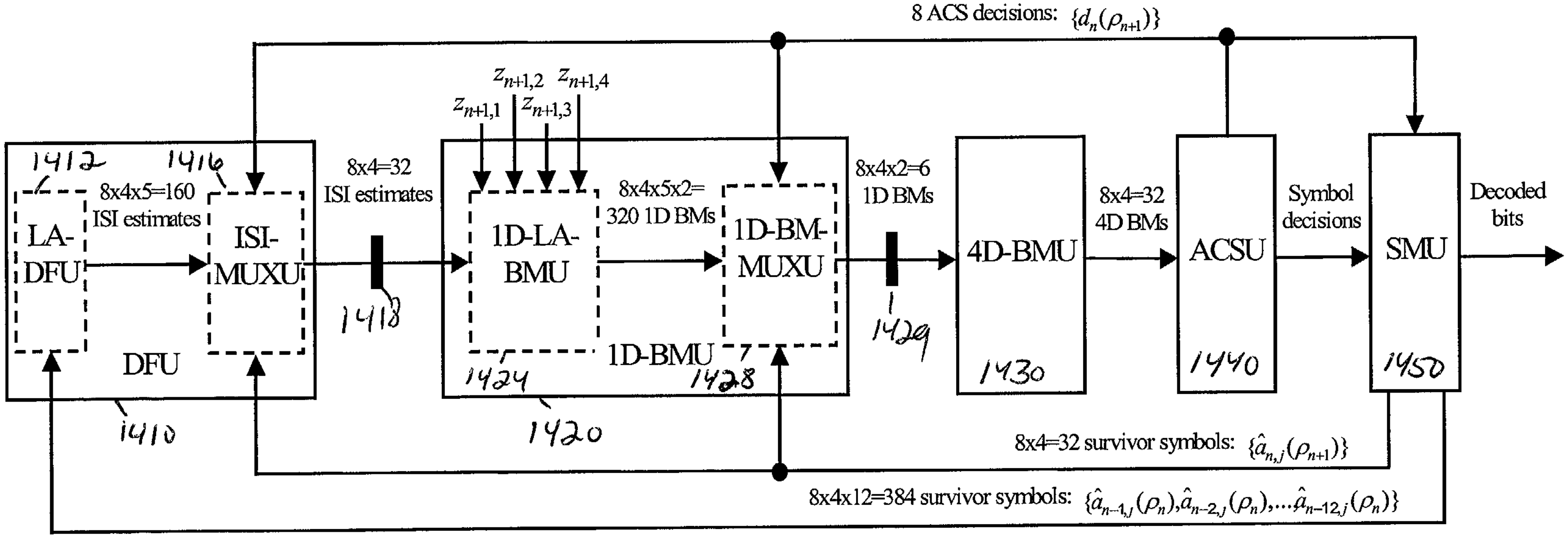

8 ACS decisions: $\{d_n(\rho_{n+1})\}$
1412
1416
LA-DFU
8x4x5=160 ISI estimates
ISI-MUXU
DFU
1410
8x4=32 ISI estimates
1418
$z_{n+1,1}$
$z_{n+1,2}$
$z_{n+1,3}$
$z_{n+1,4}$
1D-LA-BMU
8x4x5x2= 320 1D BMs
1D-BM-MUXU
1D-BMU
1424
1428
1420
8x4x2=6 1D BMs
1429
4D-BMU
1430
8x4=32 4D BMs
ACSU
1440
Symbol decisions
SMU
1450
Decoded bits
8x4=32 survivor symbols: $\{\hat{a}_{n,j}(\rho_{n+1})\}$
8x4x12=384 survivor symbols: $\{\hat{a}_{n-1,j}(\rho_n),\hat{a}_{n-2,j}(\rho_n),\ldots\hat{a}_{n-12,j}(\rho_n)\}$

FIG. 14

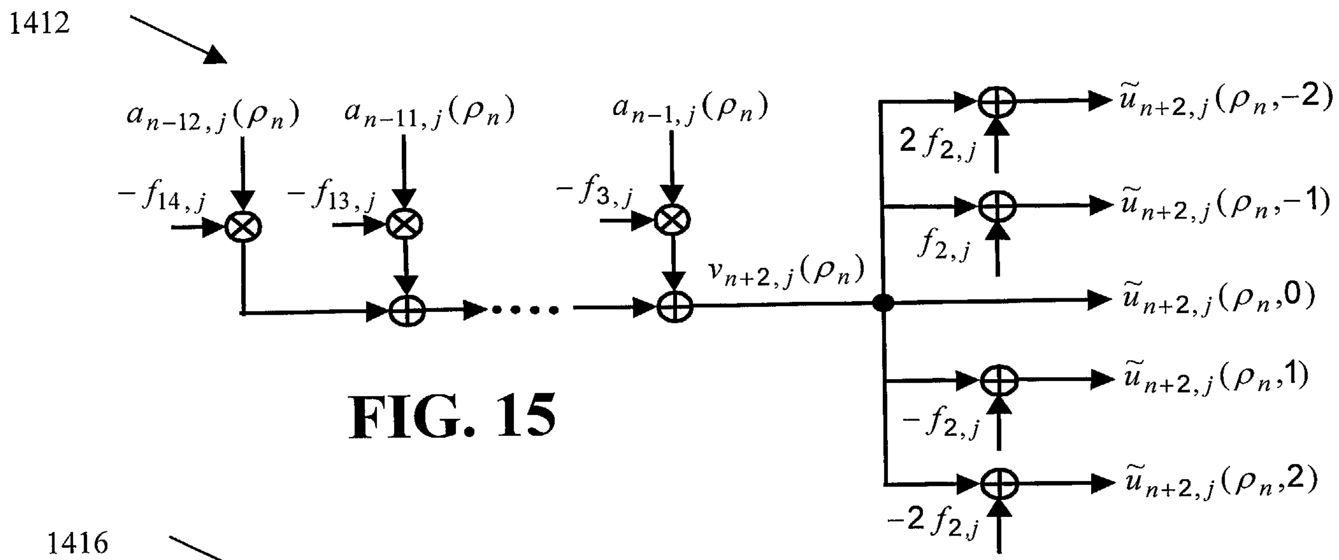

1412
$a_{n-12,j}(\rho_n)$
$a_{n-11,j}(\rho_n)$
$a_{n-1,j}(\rho_n)$
$-f_{14,j}$
$-f_{13,j}$
$-f_{3,j}$
$v_{n+2,j}(\rho_n)$
$2f_{2,j}$
$f_{2,j}$
$-f_{2,j}$
$-2f_{2,j}$
$\tilde{u}_{n+2,j}(\rho_n,-2)$
$\tilde{u}_{n+2,j}(\rho_n,-1)$
$\tilde{u}_{n+2,j}(\rho_n,0)$
$\tilde{u}_{n+2,j}(\rho_n,1)$
$\tilde{u}_{n+2,j}(\rho_n,2)$

FIG. 15

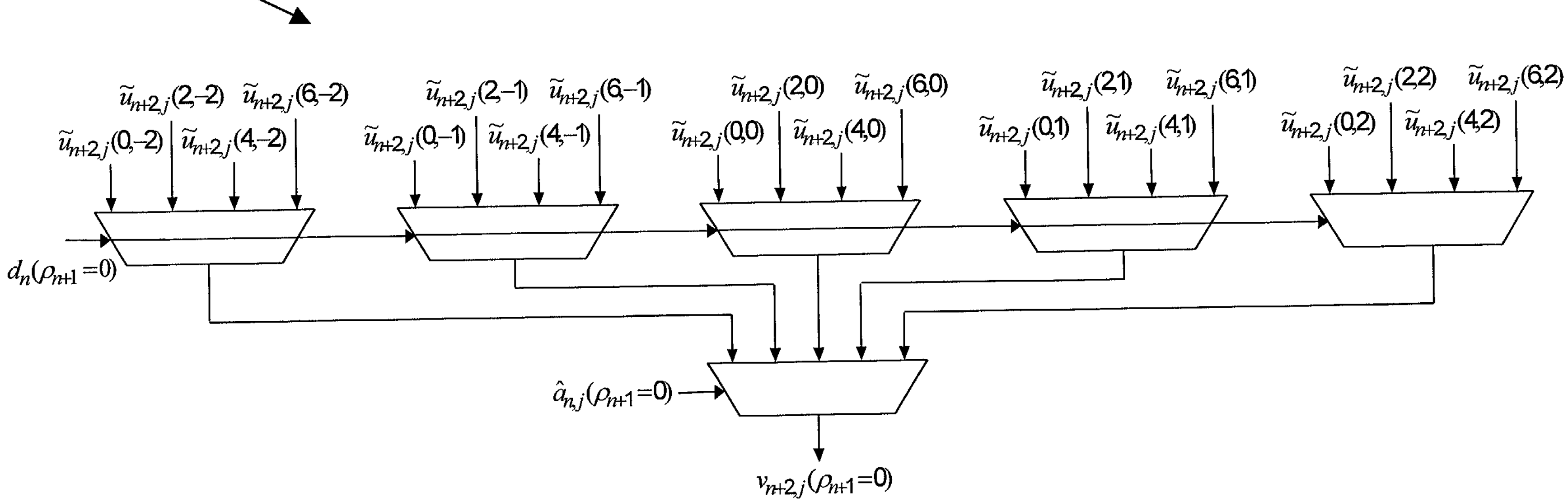

1416
$\tilde{u}_{n+2,j}(0,-2)$
$\tilde{u}_{n+2,j}(2,-2)$
$\tilde{u}_{n+2,j}(4,-2)$
$\tilde{u}_{n+2,j}(6,-2)$
$\tilde{u}_{n+2,j}(0,-1)$
$\tilde{u}_{n+2,j}(2,-1)$
$\tilde{u}_{n+2,j}(4,-1)$
$\tilde{u}_{n+2,j}(6,-1)$
$\tilde{u}_{n+2,j}(0,0)$
$\tilde{u}_{n+2,j}(2,0)$
$\tilde{u}_{n+2,j}(4,0)$
$\tilde{u}_{n+2,j}(6,0)$
$\tilde{u}_{n+2,j}(0,1)$
$\tilde{u}_{n+2,j}(2,1)$
$\tilde{u}_{n+2,j}(4,1)$
$\tilde{u}_{n+2,j}(6,1)$
$\tilde{u}_{n+2,j}(0,2)$
$\tilde{u}_{n+2,j}(2,2)$
$\tilde{u}_{n+2,j}(4,2)$
$\tilde{u}_{n+2,j}(6,2)$
$d_n(\rho_{n+1}=0)$
$\hat{a}_{n,j}(\rho_{n+1}=0)$
$v_{n+2,j}(\rho_{n+1}=0)$

FIG. 16

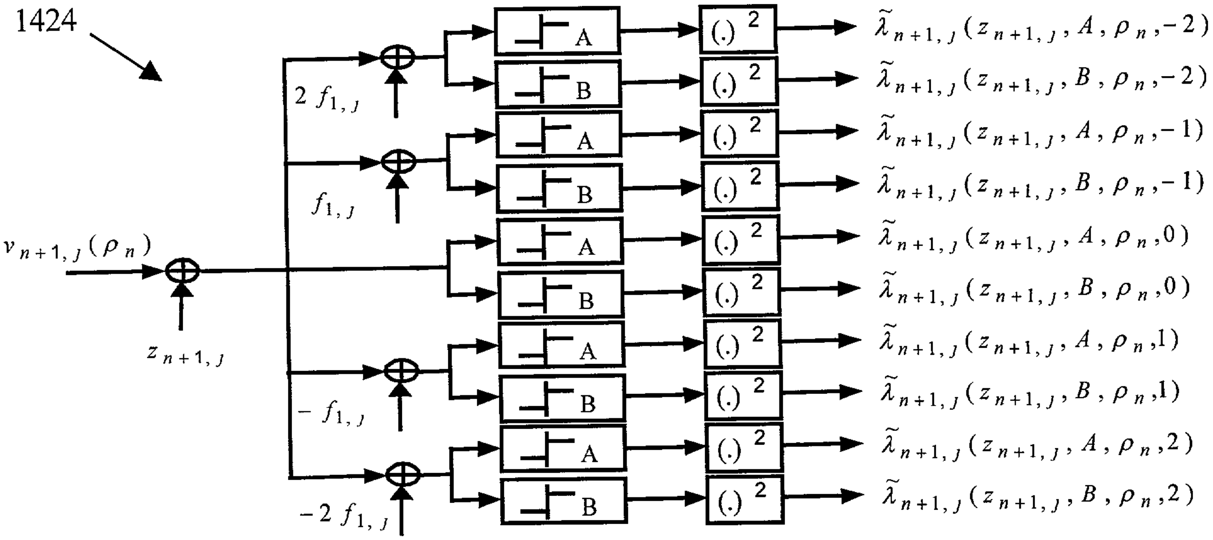

1424
$v_{n+1,j}(\rho_n)$
$z_{n+1,j}$
$2f_{1,j}$
$f_{1,j}$
$-f_{1,j}$
$-2f_{1,j}$
A
B
$(.)^2$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, A, \rho_n, -2)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, B, \rho_n, -2)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, A, \rho_n, -1)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, B, \rho_n, -1)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, A, \rho_n, 0)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, B, \rho_n, 0)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, A, \rho_n, 1)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, B, \rho_n, 1)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, A, \rho_n, 2)$
$\tilde{\lambda}_{n+1,j}(z_{n+1,j}, B, \rho_n, 2)$

FIG. 17

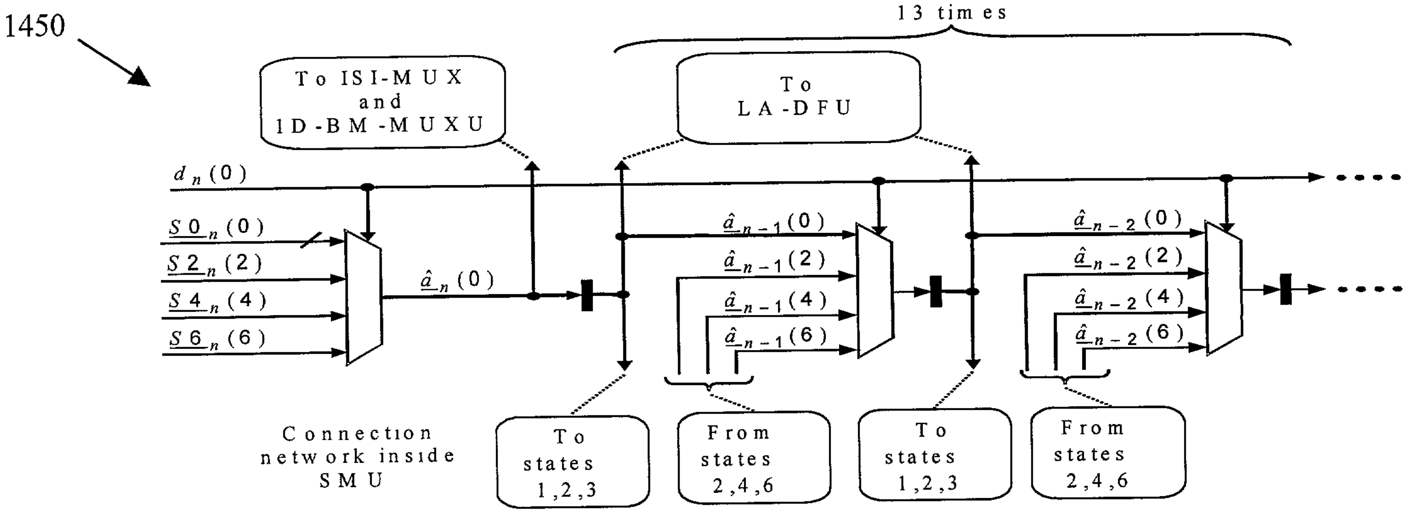

1450
13 times
To ISI-MUX and 1D-BM-MUXU
To LA-DFU
$d_n(0)$
$\underline{S0}_n(0)$
$\underline{S2}_n(2)$
$\underline{S4}_n(4)$
$\underline{S6}_n(6)$
$\hat{a}_n(0)$
$\hat{a}_{n-1}(0)$
$\hat{a}_{n-1}(2)$
$\hat{a}_{n-1}(4)$
$\hat{a}_{n-1}(6)$
$\hat{a}_{n-2}(0)$
$\hat{a}_{n-2}(2)$
$\hat{a}_{n-2}(4)$
$\hat{a}_{n-2}(6)$
Connection network inside SMU
To states 1,2,3
From states 2,4,6
To states 1,2,3
From states 2,4,6

FIG. 18